

THURSDAY, NOVEMBER 23, 1882

THE CHALLENGER REPORTS

Reports on the Scientific Results of the Voyage of H.M.S. "Challenger" during the years 1873-1876, under the Command of Capt. Sir George Nares, R.N., F.R.S., and Capt. F. T. Thomson, R.N. Prepared under the Superintendence of Sir C. Wyville Thomson, F.R.S., and John Murray. Zoology—Vols. II., III., and IV. (Published by Order of Her Majesty's Government, 1881-1882.)

SINCE our last notice of these Reports, three more volumes of the zoological series have made their appearance. In vol. ii. published in 1881, and prepared under the superintendence of the late Sir C. Wyville Thomson, the first Report is by Prof. Moseley: On Certain Hydroid, Alcyonarian and Madreporian Corals procured during the Voyage. The great interest and importance of Mr. Moseley's investigations into the structure of the Hydrocorallinæ, and on the Helioporidæ and their allies, justified a previous publication, chiefly in the *Philosophical Transactions*, of the chief results of the author's work. The third part, describing the Deep Sea Madreporaria appears now for the first time. It ought to be noted that the memoirs forming the first two parts have been recast, and contain both additions and alterations. Mr. Moseley's history of *Millepora nodosa* will be acknowledged by all capable of judging, as a most solid contribution to our knowledge of the Hydrocorallinæ. So long ago as 1859, Agassiz announced that the structure of the polyps of *Millepora* showed that they belonged not to the corals, but to the Hydroids; but although this view was confirmed by others, especially by Pourtales, who once got an imperfect view of the expanded dactylozooids, still it remained for Prof. Moseley to settle this question of affinity beyond a doubt, which he has done by his painstaking dissections. He acknowledges his indebtedness to his colleague, Mr. Murray, who saw the zooids of *Millepora nodosa* in a living and expanded state upon the reefs of Tahiti. This species forms tubercular and irregular masses, often encrusting and overgrowing the dead fronds of *Lophoseris cactus*, which is a principal component of the Tahitian reefs. While fresh, the growing tips of the lobes have a bright gamboge yellow colour, fading off into a yellowish brown; the expanded zooids have the appearance of a close-set pearly white down upon the surface of the mass. Sometimes the encrusting film is very thin. When, as at Bermuda, *M. alcornis* is found attached to glass bottles thrown into the harbour, this film will not be more than from $\frac{1}{8}$ th to $\frac{1}{4}$ th of a millimetre in thickness, and no doubt, now that attention is called to such specimens, they will be studied with the object of telling us more of the life history of these forms.

The Stylasteridæ, now definitely determined to be Hydroids, as was first strongly suggested by G. O. Sars, are described in great detail, and this portion of the report is accompanied by many splendid plates, and a list of all the species of Stylasteridæ at present known is given. Moseley places the group as a separate family, along side of the Milleporidæ, in the sub-order Hydrocorallinæ.

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The second part of the report is on Helioporidæ and their allies, in which *Heliopora coerulea* is described from living specimens, and a detailed account of its structure and mode of growth is given. We have also an extremely valuable description of a species of Sarcophyton, almost certainly *S. lobatum*, from the Admiralty Islands, and the conclusion now so well known is come to that Heliopora is without doubt an Alcyonarian.

The third part comes as a quite fresh work, for the preliminary catalogue of the deep-sea Madreporæ, was necessarily most imperfect. But here we have extended descriptions of the entire series of species dredged during the voyage, with sixteen plates and also numerous woodcuts intercalated throughout the text. No less than thirty-three species are described for the first time.

These deep-sea Madreporæ would appear to be very widely distributed, some, as for example, *Bathyaetis symmetrica*, having a world-wide range. At present the only genera which seem restricted in range are Stephanophyltia and Sphenotrochus, which have as yet only been obtained from the seas of the Malay Archipelago, and in comparatively shallower water, and the genus Leptopenus, which has been dredged throughout all the great oceans, but only south of the equator. The wide range of the species in depth has now become a well-known fact, though none the less interesting for that, the world distributed species above-mentioned ranging in depth from 70 to 2900 fathoms. The occurrence of the genera as fossils in Secondary and Tertiary deposits is also not without interest, but the deep-sea forms are not to be regarded as of greater geological antiquity than those found in shallow water.

The report on the birds collected during the voyage is by Dr. P. L. Sclater. The collection embraced about 900 specimens in skins, besides which there was a considerable series of sea-birds in salt and spirits, and a collection of eggs. The collection was formed under the superintendence of Mr. John Murray, who placed at Dr. Sclater's disposal his ornithological note-book, which contained the history of every individual specimen. It will be remembered that the main object of the expedition was the exploration of the depths of the ocean, and that the collecting of land birds formed no part of the original plan, so that the comparative smallness of the collection is not surprising. The author of the report expresses his indebtedness to his friends, the late Marquis of Tweeddale, Dr. Otto Finsch, Prof. Salvadori, Mr. Howard Saunders, Mr. W. A. Forbes, and Mr. Osbert Salvin, for the assistance they gave him in preparing this report, which is accompanied by thirty coloured plates. Many of the notes appended to the description of the penguins are taken from Mr. Moseley's published accounts of the voyage, and are doubtless already well known to our readers.

Vol. iii., published towards the close of 1881, opens with a most elaborated and magnificently illustrated report by Prof. Alexander Agassiz, on the Echinoidea. The importance of this report has already been called attention to in a special notice (*vide* NATURE, vol. xxv. p. 41).

The second and concluding report in the volume is on the Pycnogonida, by Dr. P. P. C. Hoeck. The collection of these forms was very rich in species. Of the 120 specimens dredged during the voyage, there were no less

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than 36 species, and of these 33 are described as new to science. Five other species found during the cruise of the *Knights Errant* are also included in the report. These species are referred to 9 genera, of which three are described as new. Those genera which range over the widest area, are also those which range most in depth—while there are some species peculiar to deep-sea areas. No truly generic types seem to be thus characterised. Dr. Hoeck considers that the Pycnogonidæ form a distinct and very natural group or class of Arthropods. Their common progenitor must have been a form with three jointed mandibles—multi-jointed palpi and ovigerous legs, with numerous rows of denticulate spines on the last joints. In the most primitive condition the eye of the Pycnogonid consists of a rounded transparent part of the integument, the inner surface of which is furnished with some small ganglia and nerve-fibres issuing from the integumentary nerve-bundle. The highly-developed eye of the shallow-water species show ganglionic cells, distinct retinal rods, and a lens consisting of a thickened part of the chitinous skin of the animal. Those eyes which have lost their pigment and their retinal rods are rudimentary. Dr. Hoeck, treating of the affinities of this class writes: “about the relation in which the Pycnogonida stand to either the Crustacea or the Arachnida, we know as much or as little as we do about the relation in which these two classes of Arthropoda stand to each other.”

Vol. iv. opens with an important contribution to anatomical science in the Report on the Anatomy of the Petrels (Tubinares) collected during the voyage. It is from the pen of Mr. W. A. Forbes, Fellow of St. John's, Cambridge.

The group of Petrels is one that up to the present date can scarcely be said to have been anatomically investigated. It is difficult at all times to procure specimens in the flesh—and some of the species are so large as to render their preservation a matter of considerable trouble. At the suggestion of the late A. H. Garrod, the naturalist staff of the *Challenger* made a fine collection of these oceanic birds in spirits, which contained 74 specimens belonging to 31 species and 22 genera. Prof. Garrod had scarcely commenced to work at this series before he was struck by the lingering illness which ended in his lamented and premature death, and his friend, Mr. W. A. Forbes, undertook to draw up the report which here appears. This report is of a very thorough character. Commencing with an account of the previous literature on the anatomy and classification of the group; we then have a complete sketch of the comparative anatomy of the group—the external characters, pterylosis and visceral anatomy are first described—these are succeeded by an account of the myology—to which follows a description of the tracheal structures and of certain other points in the anatomy of the soft parts, while an account of the osteology concludes the report. Some of the modifications, described by the author, “are of great physiological and morphological interest, whilst the numerous differences in points of detail displayed in the different sections and genera of the Petrels, lead one to expect that the future study of systematic ornithology will be not a little elucidated by the labours of the anatomist wherever he has material, as in the present case, at his command,

sufficient for an adequate study of a natural group on the basis of structural differences more important than those that can be discerned from the superficial inspection of an ordinary skin.” This report is illustrated by very numerous woodcuts and seven plates of anatomical details. In treating of the affinities of the group, Mr. Forbes declares it to be a difficult task to assign to it any satisfactory position in any arrangement of the class of birds.

The second report in the volume is on the Deep-sea Medusæ, by Prof. Ernst Haeckel. They form one of the smallest and least important groups of the rich and remarkable deep-sea fauna discovered during the voyage of the *Challenger*. The number of species described does not exceed eighteen, of which half are *Craspedota* and half *Acraspedæ*. These new species were briefly diagnosed in the “System der Medusen, 1879,” but they are here described at great length and with a most splendid series of illustrations. The descriptive portion of the memoir is prefaced by a very elaborate sketch of the comparative morphology of the medusæ, which is illustrated by many woodcuts.

It would seem by no means certain that all the eighteen species of deep-sea medusæ here described are constant inhabitants of the deep sea. The method of capture by the tow-net by which such delicate and fragile organisms are brought from great depths is still imperfect, and it seems probable that the greater number of medusæ brought up apparently from the greater depths really swim in shallower water, and are only taken in during the “hauling-in” of the net. But Prof. Haeckel counts that those medusæ which have either adapted themselves by special modifications of organisation to a deep-sea habit of life, or which give evidence by their primitive structure of a remote phylogenetic origin, may with great probability be regarded as permanent and characteristic inhabitants of the depths of the sea; and as such he regards fourteen out of the eighteen described. With regard to the magnificent illustrations the author states: “It is of course impossible, from the imperfect state of preservation of the spirit specimens, to expect that they should be absolutely true to nature. I rather considered it my duty here, as in those figures in my ‘System der Medusen,’ which were drawn from spirit specimens, to take advantage of my knowledge of the forms of the living Medusæ to reconstruct the most probable approximate image of the living forms, I was greatly assisted in my efforts in this direction by the skilful hand of my lithographer, Adolf Giltisch.” It seems hardly necessary to make any scientific criticisms on this straightforward statement.

The third and concluding memoir is by Hjalmar Thél, and contains the first part of his report on the Holothuroidea. It is altogether devoted to the holothuroids of the new order Elasipoda, which name has been with advantage substituted for that of Elasmopoda used in the Preliminary Report. Seven years have scarcely elapsed since the discovery in the Kara Sea of the form for which this family was established, and now over fifty species are known. These species of Elasipods are true deep water forms, and they may with all the more reason be said to characterise the abyssal fauna, as no single representative as far as is at present known has been found to exist at a depth less than 58 fathoms. Only one form,

Elpidia glacialis, has been dredged at this inconsiderable depth, and even this was dredged in the Arctic Ocean, where true abyssal forms are to be met with at comparatively shallow depths. This species too can exist at immense depths, one from Station 160 having been dredged at a depth of 2600 fathoms, the greatest depth at which any Holothuroid has to this been dredged being 2900 fathoms. Among the more remarkable and distinguishing characteristics of this order Mr. Théel mentions the agreement in several important details—both in their internal anatomy and outer forms—of the adult and larval forms, an agreement more close than occurs in any previously known Holothuroid. He does not agree with Danielssen and Korren in placing the *Elasipods* low in the series of the Holothuroids; nay in some respects he regards them as having attained to a higher development than all the other Echinoderms, because, among other facts, their bodies are distinctly bilaterally symmetrical, with the dorsal and ventral surfaces distinct and often with a cephalic region well marked. Only the ventral ambulacræ are subservient to locomotion; these latter show a tendency to appear both definite as to place and number. The dorsal appendages are so modified as to perform functions different from the ventral ones. This memoir contains forty-six plates, which give full details of the forms and structure of all the new species.

LIGHT

Light: A Course of Experimental Optics chiefly with the Lantern. By Lewis Wright. (London: Macmillan and Co., 1882.)

THIS is a book by a worker whose work in his own line is of a very high order, and whose experience will be of correspondingly high value to others who are working at the same subject. In all those departments of experimental optics in which the lantern is employed for the demonstration of actual experiments to an audience, Mr. Wright is a master hand: and his book, as might be expected, is consequently a valuable repertory of useful information and of suggestive hints. Of books on Light there are already enough and to spare. Of standard treatises and text-books in the department of Geometrical Optics the supply is more than could be desired. In Physical Optics there is still room for a good elementary mathematical text-book. In Physiological Optics also there is, save for the great treatise of Helmholtz, a void. But the work before us stands apart from all these, both in aim and in character. Indeed so well does it carry out the ideal of a work "on experimental optics chiefly with the lantern," that there was really no need to prefix to the title the word "Light." True it is that Mr. Wright does not confine himself to the mere working of lanterns and their accessories. He deals in a simple and practical way with the laws of reflexion and refraction, and with ordinary optical instruments: but he always adds something of practical interest to the teacher of optics. To illustrate the laws of reflexion and refraction he describes a simplified form of the apparatus so well known in Prof. Tyndall's lectures on Light; and the mechanical illustrations of wave-motion, &c., are also new in several respects. The chapter on Spectrum Analysis is brief and sketchy, but includes almost all the

experiments which can be projected on to the screen with the lantern. Amongst these we notice very careful instructions for exhibiting the spectrum of Newton's rings and of other interference phenomena.

Nearly one-half of the book is devoted, and well devoted, to experimental work on Double-Refraction and Polarisation. In this section there are a number of beautiful experiments described which we do not remember having seen before in any treatise in the English language. Amongst these are some with compound mica plates built up of a series of films of definite thickness and united by Canada balsam. A series of twenty-four superposed mica films, each producing a retardation of one-eighth of a wave-length and each one-sixteenth of an inch shorter than the one beneath it, is in this way made to reproduce exactly the first three orders of colours of Newton's rings, but divided into the precise tints over narrow strips. A detailed account is also given of the combinations devised by Norremberg and Reusch for reproducing the phenomena of uniaxial crystals and of quartz by the superposition of thin films of mica crossed in various ways. Plates illustrative of these combinations contribute much to the value of the descriptions and explanations of the text. Mr. Wright also gives some account of his own researches upon the spiral figures produced by the introduction of quarter-undulation plates into the polariscope in which crystal sections are being examined by convergent light. There is a penultimate chapter on the polarisation of the sky and of minute particles, followed by a final chapter—wholly out of place in such a work—in which, so far as it is intelligible, there appears to be an attempt made to connect the undulatory theory of light with the trinitarian theory of theology. With the exception of this last, and with a few occasional inelegancies of style, there is little fault to find with the book. The mathematical student of optics will without doubt grumble when he takes up the work, because the mathematical aspect of the subject is conspicuous by its absence. The author does not profess to be a mathematician: or he would hardly have pronounced in favour of Brewster's views on the theoretical polarising angle, as he does on p. 223. This, however, is a minor matter in a book whose great aim is to assist manipulation. The numerous illustrations, a large proportion of which are original, add greatly to its value. The coloured plates of polariscopic phenomena are, it should be added, of singular excellence.

S. P. T.

OUR BOOK SHELF

Practical Chemistry, Analytical Tables, &c. By J. Campbell Brown, D.Sc. (London: Churchill, 1882.)

NOTHING perhaps is more remarkable than the great increase during the past few years in the number of books on practical chemistry and analysis. This has no doubt to some extent been caused by the prominence given generally to the teaching of chemistry in the laboratory.

The books to which we refer consist with few exceptions of tabular statements of reactions of acids and bases and methods of detection of the same in simple salts or mixtures. They all appear to be on the same "type" and with the same intention of putting students through a course of drudgery in qualitative analysis according to a fixed "table." The book before us is no worse than others of its class, but attempts rather too much by giving